

hp StorageWorks Enterprise Backup Solution with HP OpenView Storage Data Protector and FalconStor VirtualTape Library Solution

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This guide provides a sample configuration and best practices for system administrators setting up an Enterprise Backup Solution using HP OpenView Storage Data Protector and FalconStor VirtualTape Library Solution. For additional information related to online storage, refer to the *HP StorageWorks SAN Design Guide*.

For the latest version of this implementation guide and other EBS documentation, go to the HP EBS web site at:
<http://www.hp.com/go/ebs>.



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Enterprise Backup Solution with HP OpenView Storage Data Protector and FalconStor VirtualTape Library
Solution Implementation Guide
First Edition (May 2004)
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About this document

This Implementation Guide covers the following major topics:

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Intended audience

This document is intended for system administrators using a disk-to-disk virtual tape solution in an EBS environment.

HP StorageWorks benefits

HP StorageWorks products support a heterogeneous mixture of applications, operating systems, servers, storage systems, and infrastructure components to provide the following advantages:

- Greater flexibility in enterprise data protection design, to meet the widest possible range of requirements
- Incremental scaling over time, by the addition of capacity and features as they become required
- Support for diverse geographic and data locality requirements

Virtual Tape benefits

The HP StorageWorks Enterprise Backup Solution (EBS) is an integration of data protection software and industry-standard hardware, providing a complete enterprise-class solution. In a typical EBS environment, there are multiple application servers backing up their data to a shared tape library on the SAN. Each application server contains a remote backup agent that sends the data from the application server over the SAN fabric to a tape drive in the tape library.

However, the backup over the SAN is single-threaded (a single host is backing up to a single tape drive); this can potentially limit the speed of any single backup, particularly with high-speed tape drives such as Ultrium LTO-2. Also, the shared tape library on the SAN can be difficult to configure for both the hardware and the data protection software.

Using LAN-based backup to solve these problems is possible, but introduces other problems. The LAN itself will become a performance bottleneck, especially compared to the higher bandwidth SAN. Also, to achieve better performance from high-speed tape drives, the LAN backups are “interleaved” so that multiple hosts can back up to the same tape drive at the same time. This interleaving means that full restores take much longer to run.

A better solution to these problems is to add a Virtual Tape Library (VTL) device into the configuration, which is one example of the Disk-to-Disk-to-Tape (D2D2T) architecture. Other examples of D2D2T include using array snapshots/clones (much higher cost) or using disk file devices in the data protection software for LAN backups (not suitable for SAN-based backups).

The virtual tape solution uses disks to simulate a tape drive/library, allowing administrators to create and attach virtual tape drives and libraries. Backup servers then see these as physical tape drives and libraries. Because the administrator can create many more virtual libraries/drives than they have physical tape drives, many more SAN-based backups can be run concurrently from the application servers. After the backups are complete, the data protection software can migrate/clone the backup data from the virtual media to physical tape media in the tape library (for offsite disaster protection or long-term archival).

Using the FalconStor VirtualTape Library Solution enables HP OpenView Storage Data Protector to transfer data to/from disk-based virtual tape at ultra-high speeds, eliminates media/mechanical failure during backup/restore operations, and enables backup servers to leverage the existing SAN fabric to access the virtual tape drive/library. Backup windows are increased, and clients experiencing slow performance can be rerouted to the virtual tape library.

Solution description

HP enterprise data protection solutions with Data Protector support the addition of a virtual tape library to complement your tape backup processes:

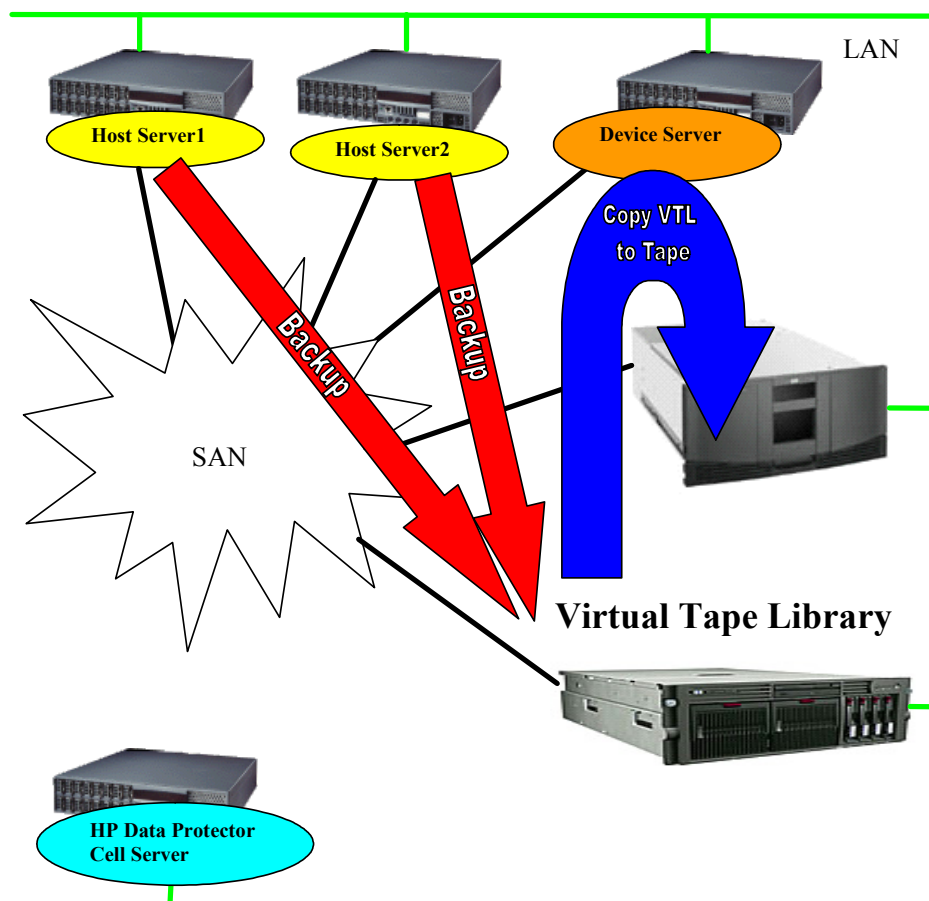


Figure 1: Virtual tape solution

VirtualTape Library Solution

The virtual tape solution uses disk storage to simulate a tape drive/library. Since virtual tape accesses the disk storage in a large sequential block (rather than the OLTP type of access) this means that high-capacity, lower-performance (and thus lower cost) disk subsystems can be used for the virtual tape. The administrator can use the remote GUI of the VirtualTape Library application to create and attach virtual tape drives and libraries to the application hosts. One possible configuration would be to create as many virtual libraries as there are hosts to be backed up, though there are both hardware and licensing limits on the number of virtual devices that can be presented on the SAN.

Tape library

The tape library currently being used for backups is still required to create the tape copies of the virtual media in the virtual tape library. Backup data stored on the virtual tape library is still onsite and is thus not protected against site disaster - offsite tape backups are the best most cost-effective way of protecting against disaster. Also, the cost of the Virtual Tape Library solution generally means that only a few days worth of backup data can be stored on it, so any longer-term archiving should still be done using tape.

Note: In the configuration recommended by this implementation guide the tape library can still be used for other backup processes that are not going to the VTL. For example, higher-performance SAN hosts can utilize the full performance of the tape drive and thus may not need to be staged to the virtual tape library.

Data Protection software

This is the data protection software application (for example, HP OpenView Storage Data Protector) that is currently protecting your application server data by running tape backup processes. Each application server host would be running remote backup agents (for example, Disk Agent and Media Agent) to allow the hosts to perform SAN-based backups to a tape library.

To support the background copy of backup data from the virtual tape library to the tape library, HP recommends that a dedicated “Device Server” is used to perform the copy. This “Device Server” runs the remote backup agents that allow it to copy data directly from the VTL media into the tape media, with the data passing over the SAN from the VTL to the device server and then back again to the tape library. This configuration means that the tape copy does not impact the running application servers, and so can be run in the background after the backups are completed.

Usage model

Any application servers that are backing up over the SAN and are unable to fully utilize the performance of the tape drives can re-route their backups to the virtual tape library device (which appears as SAN-connected tape libraries and tape drives to the data protection software). This stages the backup data on disk storage before it is copied to tape in the background. The use of the virtual tape library as a disk stage in the backup process means that backup/restore will be higher performance (because you can have more concurrent backups to the virtual tape drives than you could have to the lower number of physical tape drives) and higher reliability.

Administrators must evaluate their current backup processes to identify current SAN-based backups (or backups that could be run over the SAN) that are having performance problems. They can then create virtual tape libraries appropriate for the hosts that will be re-routed to use the VTL device. This could mean creating a virtual library for every host, or it could mean creating several virtual libraries that are shared by several hosts. The goal is to provide enough virtual tape drives to meet the maximum number of concurrent backups the administrator wants to run. After creating the virtual libraries and mapping them to the hosts that will be using them for backup (that is, restricting SAN access to the virtual library to just the WWNs of the hosts), the administrator must then configure the new libraries in the data protection software. They must then reconfigure the backup jobs for those hosts so that they are redirected to use the virtual library devices (which will appear as standard tape libraries).

When reconfiguring the backup jobs, the administrator should also change the data retention time of these backups so that the virtual media expires quickly. There will generally only be a few days worth of capacity on the virtual tape library device (due to the cost of disk storage) and the virtual media is being indefinitely retained in the virtual library. One example would be to have enough capacity in the Virtual Tape Library for two day's worth of full backups, and to set a retention time of 48 hours - this would mean that each daily full backup would overwrite the virtual media used for the full backup from 48 hours days ago, which ensures that there is always one good full backup retained in the VTL.

The final step is to configure the backup copy from virtual media on the VTL to the physical media in the tape library (for offsite storage or long-term archival). This process is performed by the data protection software (via the Device Server); the administrator must configure a scheduled copy job to run after all the backups have completed. The simplest way to do this in Data Protector is to configure a single scheduled copy job that:

- Starts when all the backup jobs to the VTL have finished
- Specifies the Tape Library as the target device
- Specifies all the virtual libraries on the VTL as the source devices
- Copies all media in the source devices that were used for backups in the last 24 hours (relative time)
- Sets the data retention time for the resulting copy tapes to the retention time used when the backups were going directly to tape. If the original tape backups had different retention times for different backup jobs (for example, daily, weekly, monthly), the administrator would need to create multiple scheduled copy jobs, one for each retention period, with a backup job filter so that it would only copy media from specific backup jobs requiring that tape retention period.

Note: In Data Protector v5.1, the schedule copy operations only support like-to-like media copies; the virtual media type (and thus the virtual drives) must match the type of the tape library. For example, if the tape library is LTO1, the virtual libraries/drives must also be LTO1 to allow background tape copy via the Data Protector software.

Using the data protection software to perform the copy from virtual to physical media is used instead of the transparent migration feature in the VirtualTape application because:

- It is impossible to set different retention times for the virtual media compared to the physical tape media
- Any media management software (for example, HP OpenView Storage Media Operations) cannot handle the same media (virtual and physical) being in two places at the same time and will therefore lose the media location
- The tape copy process is not 100% reliable (media can fail, virtual media might not fit on physical media) and the virtual media location does not match the physical tape library location. The administrator must run a separate manual media management process to locate and eject the copy media, deal with copy failures, and so on.
- The tape library cannot be used for other tape backup processes since it would be owned and managed by the VTL

Configuration overview

Your virtual tape solution may contain the following components:

Hardware components

HP hardware components may include:

Table 1: Solution hardware components

Component	Description
HP ProLiant DL580 server	Enterprise class, 4-way server. High availability features include Advanced Memory Protection technology, an integrated RAID controller, a duplex drive cage, and hot-plug redundant components. Integrated Lights-Out technology allows remote administration.
HP StorageWorks MSA1000	A 2 Gb Fibre Channel storage system that controls up to 42 Ultra2, Ultra 3, or Ultra320 drives allowing capacity of six terabytes.
HP StorageWorks E-Series ESL library	Fully integrated into ETLA, provides self-aware tape storage designed specifically for the SAN.

Software components

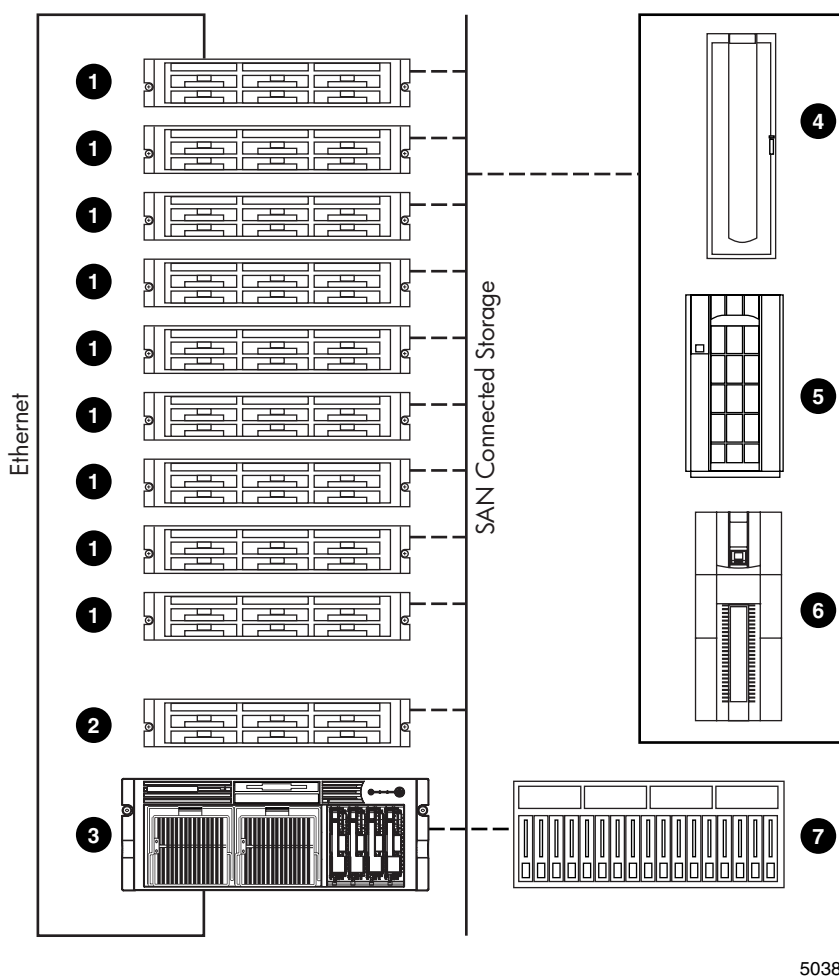
Solution applications may include:

Table 2: Solution software components

Component	Description
HP StorageWorks OpenView Storage Data Protector 5.1 (required)	Provides enterprise data protection and disaster recovery.
FalconStor VirtualTape Library Solution (required)	Allows backup software to transfer data to/from disk-based virtual tape.
Compaq Insight Manager v7.0 (optional)	Provides common fault, configuration, performance, and asset management across all HP server assets. It also enables management of clients, printers, storage, and other devices.
HP OpenView Storage Area Manager v3.0 (optional)	Network storage management solution that offers automatic discovery, topology maps, storage capacity assessment, capacity planning, and performance monitoring, all through one centralized management station.
HP OpenView Storage Media Operations v3.01 (optional)	Provides tracking and management of offline storage media.

Configuration detail

While a wide variety of hardware and software component combinations are supported, the following components were used in a recent test by HP engineers.



5038B

Figure 2: Test configuration

❶	HP ProLiant servers running Microsoft® Windows® (Data Protector 5.1 Media Agent clients)
❷	HP ProLiant server running Windows 2000 (Data Protector 5.1 Cell Manager)
❸	HP ProLiant DL580 server running FalconStor VirtualTape Solution (custom Red Hat 7.3 kernel)
❹	Device for Media Agent storage
❺	Device for Media Agent storage
❻	HP StorageWorks ESL E-Series tape library
❼	HP StorageWorks MSA1000 (for FalconStor virtual library)

Configuration setup

HP recommends the use of a DL580 or larger ProLiant server for use as the FalconStor VirtualTape Library server. The typical VTL configuration requires four HBAs (two to function as targets presenting the VTL to the fabric, two functioning as initiators sending data to the MSA1000).

HP also recommends the MSA-class of disk array be used for this solution as the target for the VTL. FalconStor recommends that any storage array used for a VTL be completely dedicated to the FalconStor server.

Before installing your backup software, refer to the *HP StorageWorks EBS Design Guide* for assistance in setting up your hardware for optimal performance and compatibility.

Installation checklist

To ensure that all components on the SAN are logged in and configured properly, you must be able to answer yes to each of the following questions:

- Are all hardware components at the minimum supported firmware revision (HBA, Fibre Channel switch, interface controller (router), tape library drives, tape library robot)?
- Is the minimum patch level support for the OS installed?
- Is the minimum supported HBA driver loaded on the host?
- Is the tape library online?
- Are all tape and robotic devices mapped and configured on the router?
- Is the router correctly logged into the Fibre Channel switch?
- Is the host server correctly logged into the Fibre Channel switch?
- If the Fibre Channel switches are cascaded or meshed, are all Interswitch Links (ISL) ports correctly logged in?
- Are the router and the host server HBA in the same switch zone (either by World Wide Name (WWN) or Port)?
- Does the host server detect all of the tape and robotic devices intended to be used?

Note: HP recommends placing your devices in zones and then making them available to the server.

Configuration considerations

- Follow the HP StorageWorks EBS Compatibility Matrix and the *HP StorageWorks Enterprise Backup Solution Design Guide*.
 - The matrix of hardware, software, and firmware is updated monthly and helps customers and support personnel maintain their EBS environment. It is not necessary to immediately update an environment to the latest revision on the matrix. However, you should be aware of updates and changes if you experience any problems that may be related to newer or older software, driver, and/or firmware versions.
 - The design guide describes currently supported EBS hardware configurations and how to efficiently and effectively provide shared tape library backup in a heterogeneous SAN environment.
 - Be sure all of your devices show up in the detected hardware list.
 - During drive configuration, be sure all of your devices show up under the proper robotics device.
 - Be sure your backup account login has administrator privileges if you want to back up everything.
- Limit rebooting during backup windows.
 - Rebooting hosts in an EBS environment during backup windows may cause job failures and configuration errors.
 - When rebooting is necessary, verify the configuration of the host when maintenance or reboot is complete.

Validating the configuration

After configuring the FalconStor VirtualTape library and zoning in the assigned WWN(s) on the FalconStor server that present the library to the fabric, the Windows server should be able to see the robot and drives following a rescan in Device Manager. After the robot and drives are shown, the backup application can be configured to use them as with a physical library.

To further validate the configuration, ensure that:

- FalconStor VirtualTape is able to recognize available space from array storage

Note: The FalconStor VTL server will not allow users to switch a Fibre-Channel HBA port to target mode if that port already has array storage visible to it. This is a feature that prevents accidental data loss. Therefore, it is necessary to employ zoning for all FC HBA ports on the VTL server to ensure that the ports to be configured in target mode do not already have access to array storage from the SAN fabric.

- VirtualTape is able to create a virtual library and label virtual tape volumes using array storage.
- Data Protector can recognize the virtual library as an emulated ESL9000-series or other designated library.
- Data Protector is able to back up data to the virtual library via VirtualTape.
- Data Protector can copy data from the virtual library to a physical library via Cell Manager, so that an alternate server from the original backup server can perform the copy.
- Data can be restored to original and alternate locations. Perform verification on restored files using third-party verification tools.
- Different Media Agent servers are able to back up to the virtual library and the physical library simultaneously.
- Data can be restored back from the physical library.

Note: Premount jobs in Media Operations are intended to help the user with the process of pre-loading media into physical drives and libraries before the media is required for backup jobs. Because the FalconStor VTL uses virtual media, premount jobs do not really apply to the VTL. Attempting to use the load/eject methods in Media Operations against the FalconStor VTL will have no effect.

For more information

For detailed information on HP StorageWorks EBS configuration and the FalconStor VirtualTape Solution, see the following web sites:

<http://www.hp.com/go/ebs>

<http://www.falconstor.com/backupconsol.asp>